Necessary tools, devices, materials

To perform the work you will need:

1. Electrical tools.

Picture 1

2. Set of connecting wires.

Picture 2

3. Satellite monitoring GALILEOSKY v4.0 terminal (hereinafter - terminal)

Picture 3

4. Windows-based computer with the installed program of configuration of GALILEOSKY terminals – "Configurator" (hereinafter – Configurator). It is recommended to install the latest version of the program from the site http://7gis.ru/support/konfigurator.html

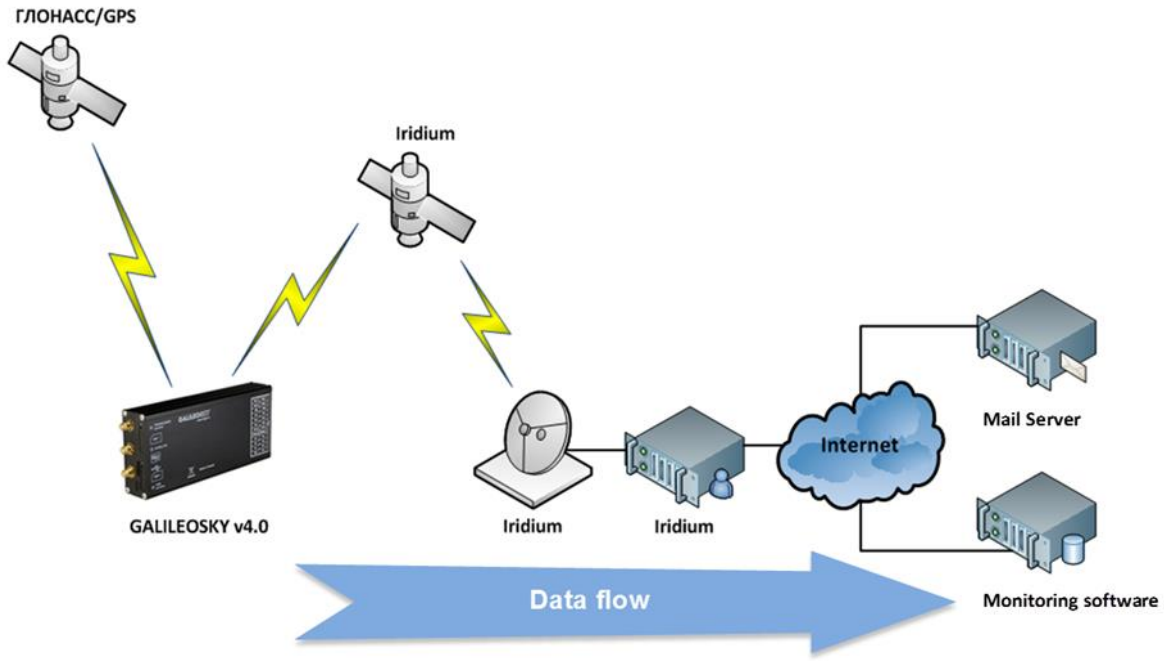
Picture 4

General information

The GALILEOSKY v4.0 terminal in addition to the traditional GSM module is equipped with the satellite Iridium module. Thanks to this the terminal can transmit information about the location and condition of the vehicle, even where there is no cellular connection.

Picture 5 shows a diagram illustrating the process of transferring data from the GALILEOSKY terminal through Iridium satellite channel (hereinafter – Iridium channel). In the current Iridium channel configuration:

- data transmission is carried out in the unilateral direction from the terminal to the monitoring server or e-mail of the user; the final destination is defined by the user of the Iridium channel;
- the voice communication and sending of commands via the Iridium channel isn't supported.



Picture 5. The scheme of the organization of communication via the Iridium channel

GALILEOSKY v4.0 terminal connection

Preparation of the socket of the terminal, SIM-cards inserting, installation, connection and setting of the terminal for data transmission via GSM channels is performed according to the recommendations of the manual "Installation and connection of GALILEOSKY terminals". The current user's manual can be downloaded at the link http://7gis.ru/en/support/documentation.html

Connection of Iridium satellite antenna

Together with the terminal there is an antenna for module of satellite communication Iridium (hereinafter – Iridium antenna). Antennas are made by various manufacturers and may differ in appearance (Pic. 6).

Picture 6. Iridium antennas

Connection of the GSM antenna, the GLONASS/GPS antenna, the Iridium antenna is carried out to the corresponding sockets, as shown in Picture 7.

Picture 7. Antennas connection

The order of placement of antennas in the vehicle and of connection to the terminal is the following:

- place the GSM-antenna in the cabin as close to the windscreen as possible or on the vehicle roof, as shown in the Picture 8;
- place the GLONASS/GPS-antenna in the cabin as close to the windscreen as possible or on the vehicle roof, as shown in the Picture 8;
- place the Iridium antenna in the cabin as close to the windscreen as possible or on the vehicle roof, as shown in the Picture 8;
- pull along GSM-antenna, GLONASS/GPS-antenna and Iridium antenna wires to the installation place of the terminal and connect them to the corresponding sockets of the device, as shown in the Picture 7.

Picture 8. Ways of antennas placement

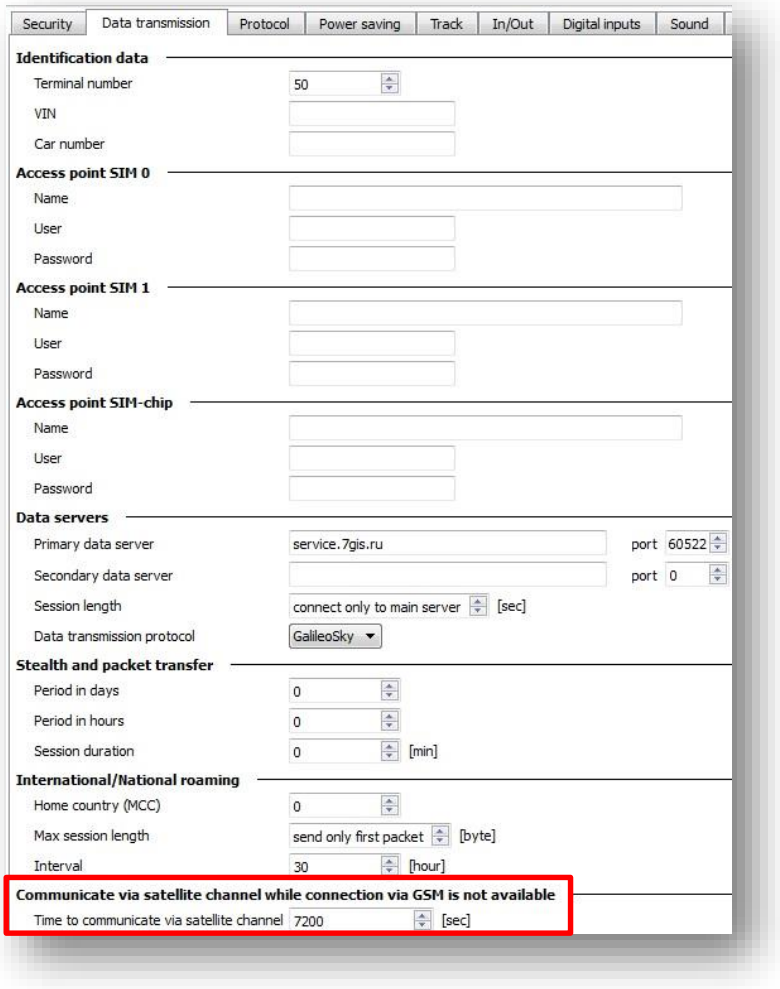
Setting of the terminal for data transmission via the Iridium channel

In a usual operating mode of the terminal the Iridium module is switched-off. When the terminal determines that there is no communication via GSM-channel, it starts counting the time interval to enable an Iridium module. Along with this, the terminal tries to reestablish communication via the GSM channel. If the connection still fails, the Iridium module is automatically activated and within 10 minutes, the terminal tries to send the last recorded point of the main packet with the current coordinates and readings of the sensors.

After successful sending of a point or once the period for sending the point expires the terminal waits again a predetermined time interval. If GSM coverage is still missing, terminal again sends the packet through the Iridium channel.

The time interval to enable the Iridium module and data transmission via the Iridium channel is set in the Configurator or with the help of *Sputnik* command (see Table 1). The order of setting in the Configurator is the following:

1. start the Configurator and connect the terminal to a computer;
2. go to the "Settings" tab -> "Data transmission";
3. set the value of the time interval in seconds in the field "Time before contact" (Pic. 9). If the value is equal to 0, the satellite module is not used;
4. press "Apply" button.



Picture 9. Setting of Iridium channel usage

The format and explanation of *Sputnik* command is shown in Table 1 of this manual.

Table 1

Command format	**Sputnic t**
Parameters	**t** – A period of establishing the communication with the help of the satellite modem, [sec.]. At the value equal to 0, the satellite modem is not used.
Explanation	Sets the period of establishing the communication with the help of the satellite modem.
Example	Request: Sputnic 1200 Reply: SPUTNIC: 1200;

Diagnostics of quality of the Iridium channel

When using the GALILEOSKY v4.0 terminal it is necessary to consider the demands of the Iridium channel to quality of the established connection. High-rise buildings, atmospheric conditions, other subjects and the circumstances interfering establishment of direct visibility between the antenna and the satellite can influence quality of connection.

You must also take into consideration the circumstance that the Iridium satellites are constantly moving relative to the Earth surface, and it can take up to 10 minutes to establish the direct line of sight between the antenna and the satellite.

The quality of the connection can be estimated in the Configurator. The order of evaluation is the following:

1. switch-off the GSM antenna;
2. launch the Configurator and connect the terminal to a computer;
3. go to the "Settings" tab -> "Data transmission", set the value of 30 seconds in the field "Time before contact";
4. go to the "Troubleshooting" tab and tick the field "Time" and "Satellite modem"; remove all the rest ticks;
5. press "Start troubleshooting" button and wait for 10 minutes;
6. after completion of troubleshooting configure "Time before contact" again and connect the GSM antenna;

In the process of troubleshooting you will see messages of the following type:

Sputnik. Power on
06:07:20
Sputnik. Net found
Sputnik. > ATE0
Sputnik. < ATE0
Sputnik. > OK
Sputnik. < AT+CULK?
Sputnik. > +CULK:0
Sputnik. > OK
Sputnik. < AT+CSQ
06:07:30
Sputnik. > +CSQ:5
Sputnik. > OK
Sputnik. < AT+SBDWB=29
Sputnik. > READY
Sputnik. > 0
Sputnik. < AT+SBDI
Sputnik. > OK
06:07:40
GSM. Success turn on.
Sputnik. > SBDI: 1, 17, 0, 0, 0, 0
Sputnik. Message send
*Sputnik. < AT*F*
Sputnik. > OK
Sputnik. Power off

The *CSQ* parameter shows the quality of the connection established with the satellite. CSQ can take values from 0 (there is no connection) to 5 (the maximum quality of connection).

SBDWB parameter informs about the packet size for sending via the Iridium channel.

Sputnik. Message send message informs about the successful sending of the packet via the Iridium channel.

Control of expenses for data transmission via the Iridium channel

To be able to use Iridium satellite channel, the user should make a contract with «RPC «GalileoSky» LLC or other Iridium partner (hereinafter - service provider). At the time of preparation of this manual the service provider provides end users with two Iridium satellite channel usage service tariffs. The specialists of the Sales department of the service provider can specify the description and comparative information on provided tariffs. Contacts of the Sales department of "RPC "GalileoSky" LLC can found on website http://7gis.ru/en/contacts.html.

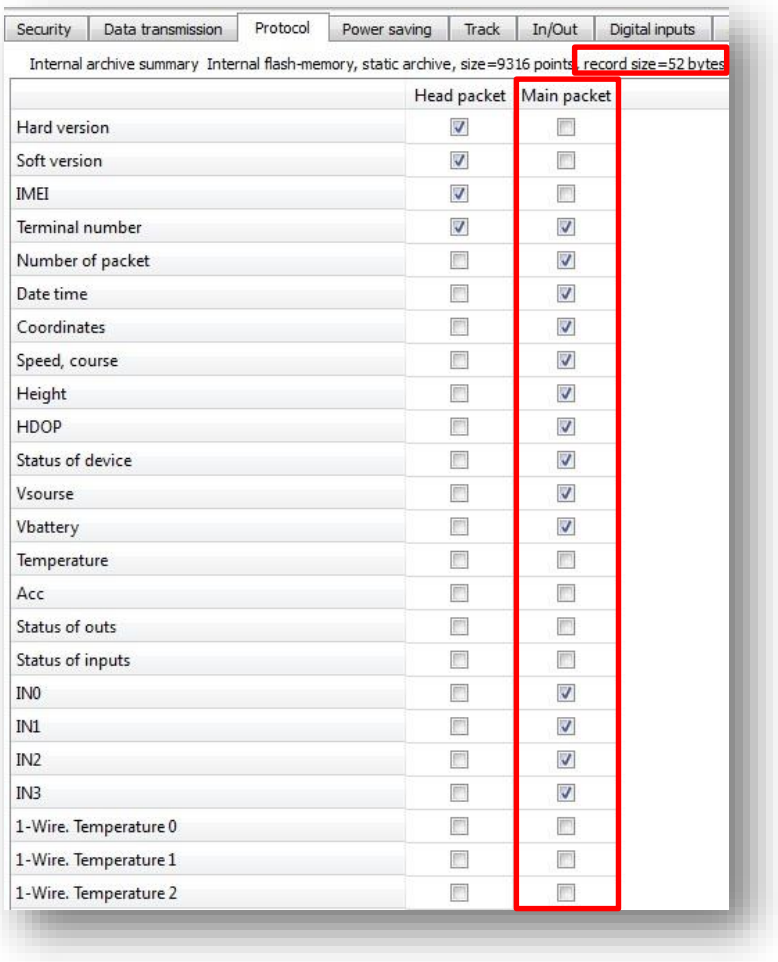
After signing the contract, the service provider activates the tariff upon the user`s request to email support@7gis.ru account to access a personal account to the user. In the process of services rendition, provider gives the statistics of the Iridium channel using and issues invoices for the rendered communication services on the basis of the provided statistics.

When using the Iridium channel, the question of control of expenses is one of priority. The algorithm of operation of the GALILEOSKY terminal allows to minimize and to control these expenses:

- the Iridium channel is used after the set interval of time by inaccessibility of the main communication channel;
- there is an opportunity to turn off the Iridium channel;
- when the communication session via the Iridium channel is established, the terminal transmits only one last recorded point of the main packet.

Thus, the user of the terminal has an opportunity in advance to calculate and to set the volume of a point of the main packet which is transmitted via the Iridium channel. For configuring you should:

1. launch the Configurator and connect the terminal to a computer;
2. go to the "Settings" tab -> "Protocol";
3. tick the fields to be send in the main packet. The main packet point size is displayed on the top in the information line (Pic. 10);
4. press "Apply" button.



Picture 10. Main packet setting

Setting of the GalileoSky terminal for data transmission via the satellite Iridium channel is completed, the terminal is ready to operate.